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GB 0908321
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(54) A magnetic valve

(57) The magnetic valve is a unitary component (10) consisting of a magnet core (15), a valve housing (12) and a magnet housing (14, 16). This is preferably produced by sintering or extrusion. At the upper part, there is an armature plate (21) which is resiliently connected to the housing by means of a leaf spring (22) a rod (20) passing through the magnet core (15) is non-positively or positively connected to the control slide (29). Different control functions can be achieved in accordance with its design. The unitary component (10) has the advantage that no expensive assembly and adjustment operations are required.

FIG.1

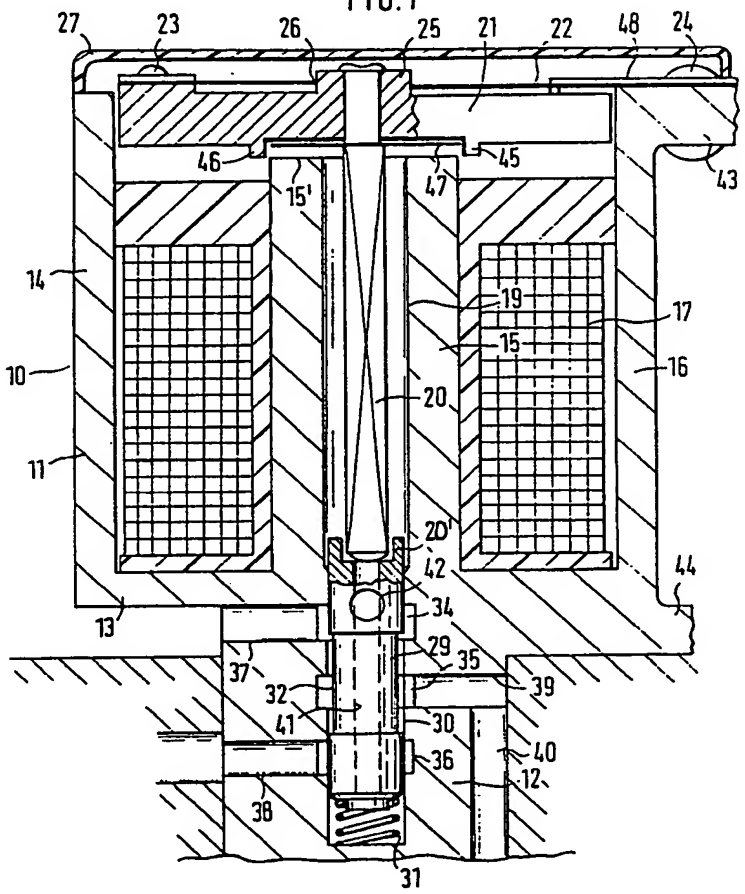

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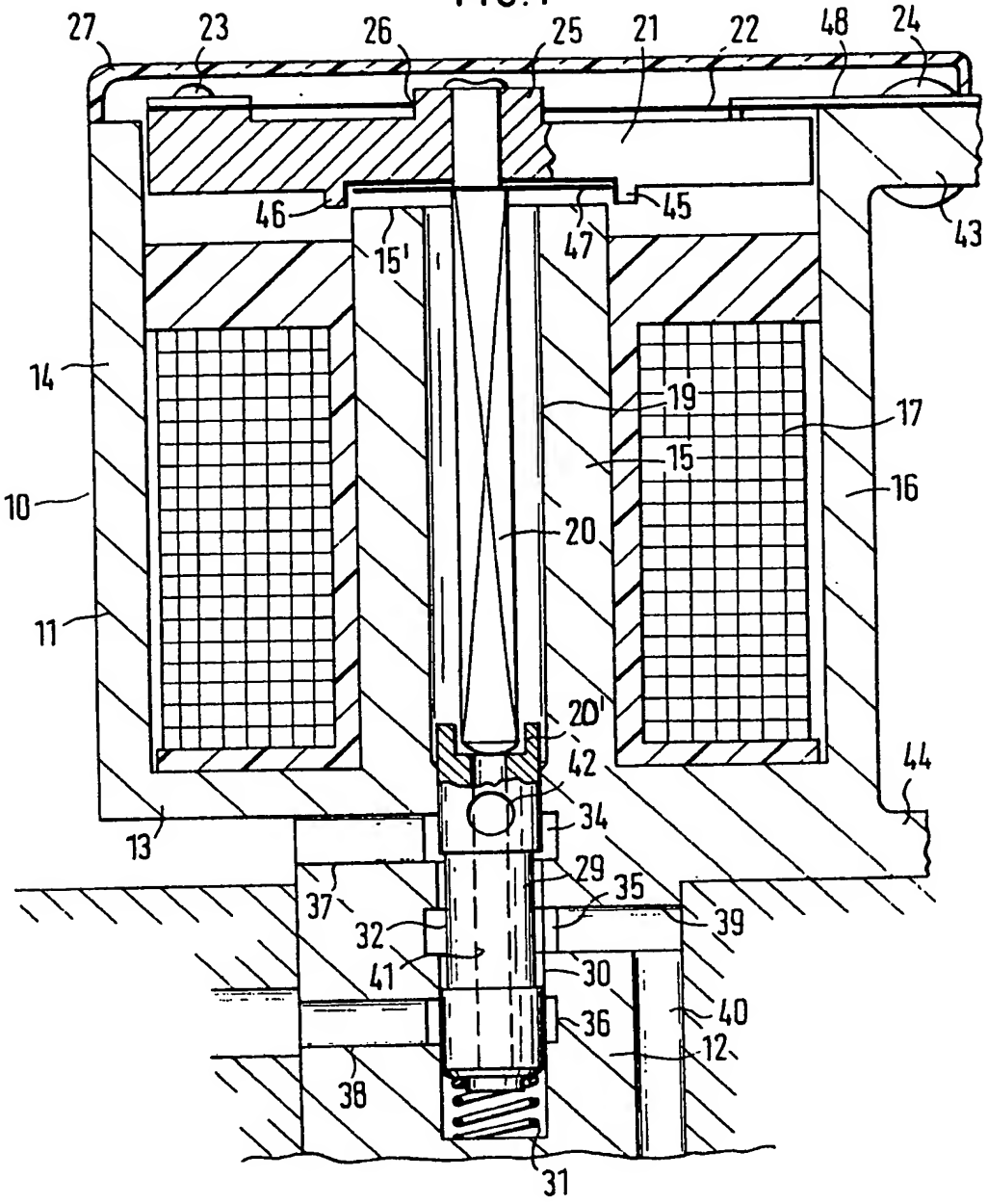
FIG.1



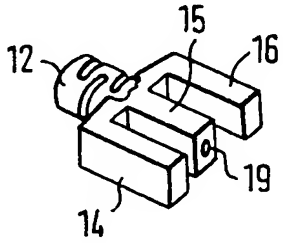


FIG.2

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FIG.3

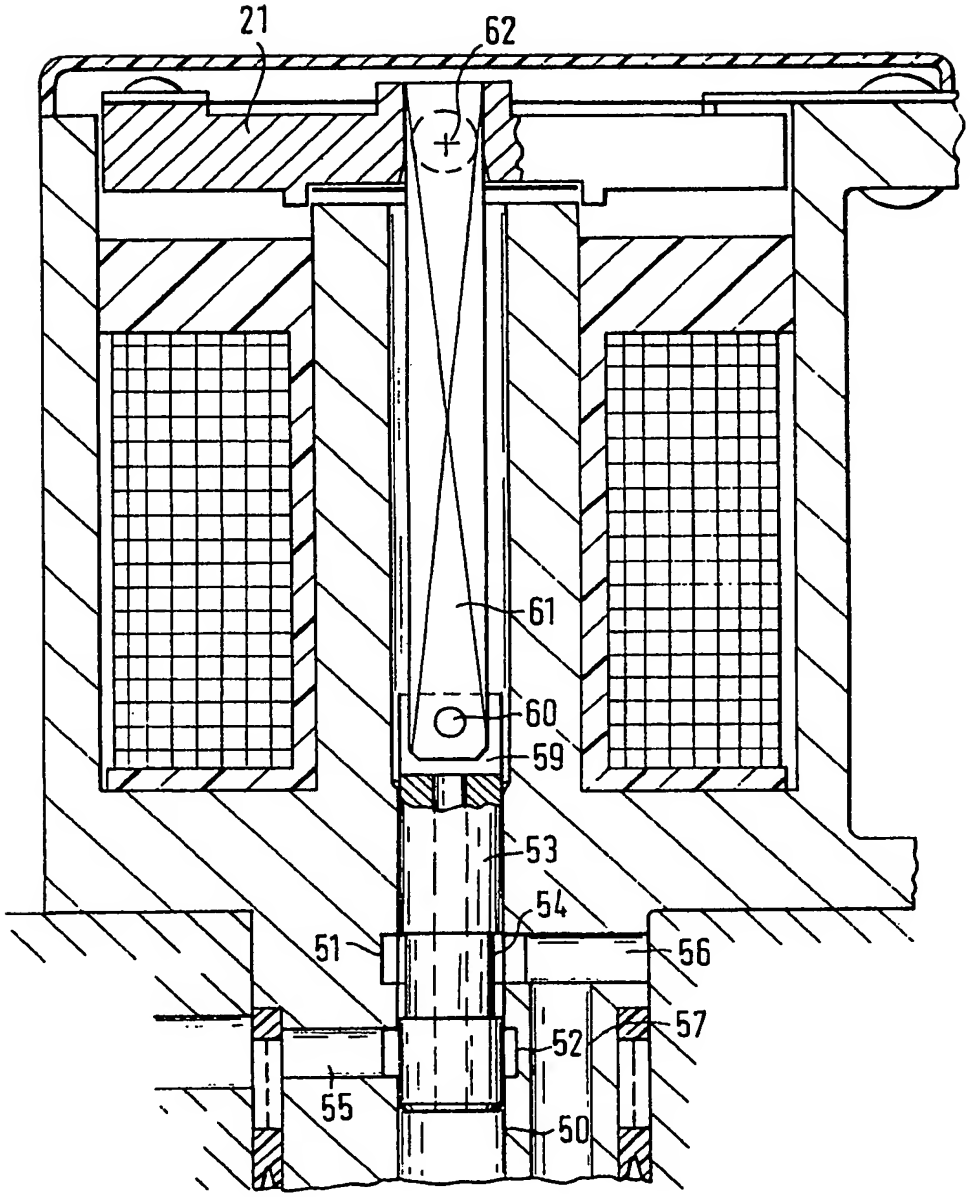

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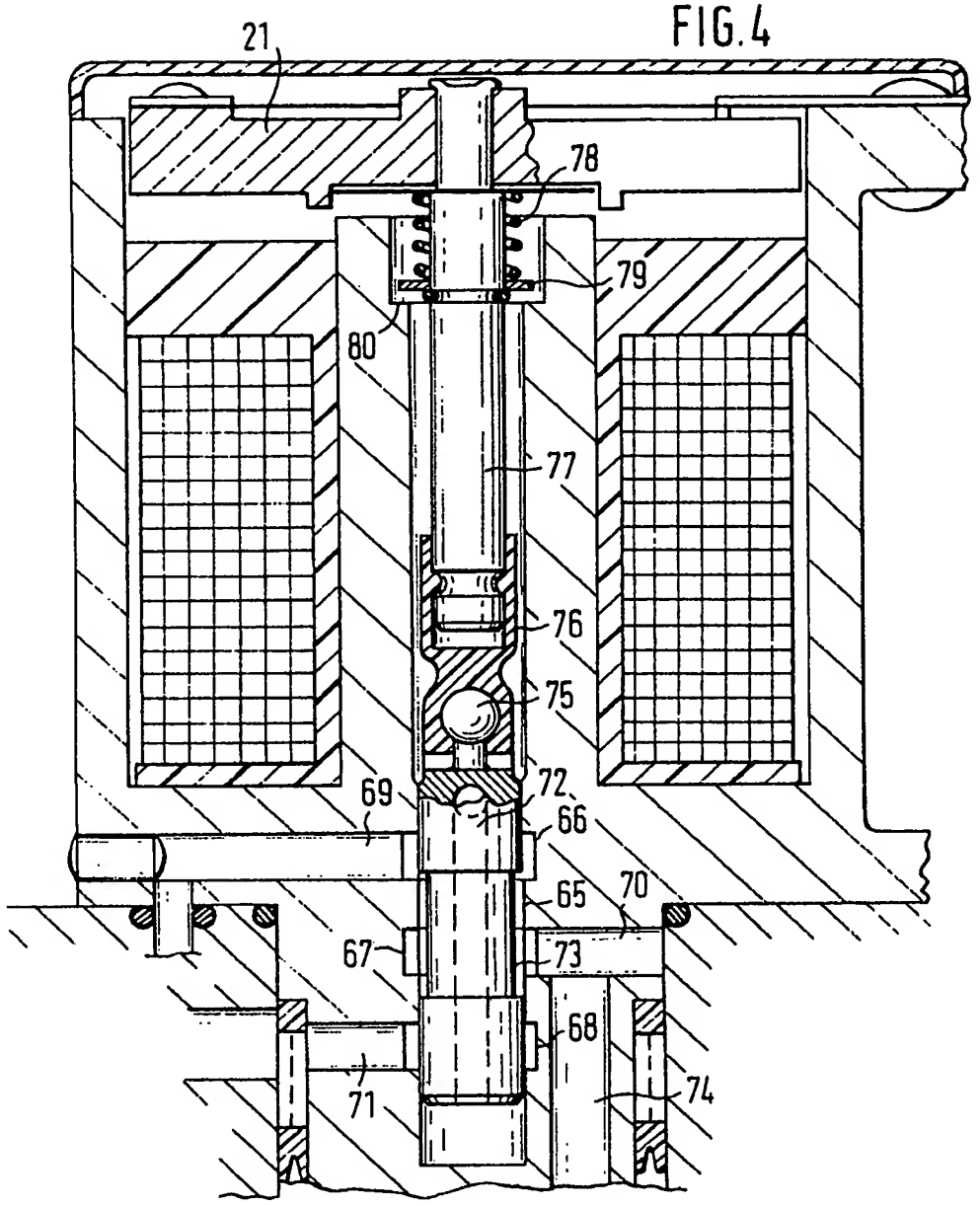
FIG.4



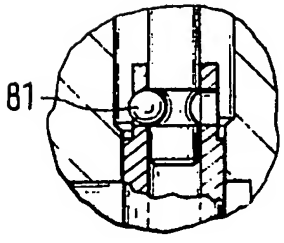


FIG.5

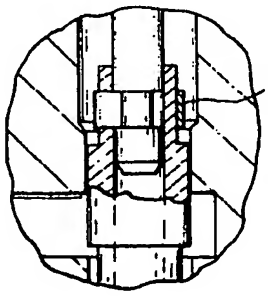


FIG.6

SPECIFICATION
A magnetic valve

State of the Art

The invention originates from a magnetic valve according to the preamble to the main claim. With one known valve of that kind, the external portion of the housing and the magnet core, that is to say the magnet part and the valve housing, form individual parts which have to be assembled. The consequence of this is a very high cost of assembly since the individual parts must be made to different tolerances and also be accurately aligned. Such a magnetic valve is made relatively expensive thereby in mass production.

Advantages of the Invention

As opposed to this, the magnetic valve in accordance with the invention comprising the characterising features of the main claim has the advantage that the magnet portion and the valve housing portion require no assembly outlay and can be produced extraordinarily cheaply particularly when the part is produced by sintering or by extrusion.

Advantageous further developments and improvements of the features set forth in the main claim are made possible by the measures set forth in the sub claims.

Drawing

Embodiments of the invention are illustrated in the drawing and are explained in detail in the following description. Figure 1 shows a magnetic valve in longitudinal section, Figure 2 shows a substantial part in a perspective representation, Figures 3 to 6 show a modification of the embodiment according to Figure 1, illustrated only as a partial section.

In Figure 1, a housing is referenced 10 which is made unitary and consists of the magnet portion 11 and the valve housing 12. The housing is so formed that three substantially square portions 14, 15, 16 extend parallel to one another from a plane base plate 13 in one direction whereas the valve housing 12 extends coaxially with respect to the portion 15 but in an opposite direction. The part 10 is illustrated particularly clearly in Figure 2.

The two external portions 14, 16 are somewhat longer that the portion 15 forming the magnet core. A coil 17 is wound around the magnet core 15, that is to say it is located between the magnet core 15 and the external portions 14, 16.

A longitudinal bore 19 is formed passing through the magnet core 15, in which extends a rod 20 which is rigidly connected to a plate-like armature 21. The latter extends between the two external portions 14, 16 and is resiliently connected to the housing 10 with the aid of a freely overhanging leaf spring 22. On the one hand, the leaf spring is connected to the armature by a screw or a rivet 23 and on the other hand is connected to the housing by a screw or a rivet 24. It is to be understood from this that the leaf spring is subjected to tension. In the centre, the armature 21 has a short extension 25 which passes through a hole 26 in the leaf spring. The armature is covered externally by a plastics hood 27.

The rod 20 is located in a recess 20' at the end of the control slide 29 which is permanently urged against the rod by a compression spring 31 arranged in the slide bore 30. The control slide 29 has a central elongate annular groove 32 which cooperates with three annular grooves 34, 35, 36 formed in the slide bore 30. A bore 37 leads outwardly from the annular groove 34. It is in communication with a reservoir (not shown). A second bore 38 parallel to the bore 37 extends from the annular groove 36 likewise to the outside of the housing. This is in communication with a source of pressure medium (not shown). A bore 39 also extends from the annular groove 35 to the outside of the housing. It is in communication with a duct 40 which has a connection to a load. A longitudinal bore 41 is formed passing through the control slide itself and into which a transverse bore 42 enters in the vicinity of its upper end. These two bores serve purely for the discharge of leakage oil.

The control slide together with its valve housing is formed as a 3/2-way valve. It also serves as a counter bearing for the armature 20. The valve housing 10 also has two flange-like webs 43, 44 which serve for its connection to another part. Two parallel extending webs 45, 46 the full width of which is somewhat greater than the width of the core 15, are arranged on the inwardly directed portion of the armature. A shoulder which a thin non-magnetic intermediate plate 47 engages is formed at the upper part of the rod 20.

The housing 10 is preferably formed as a sintered part or as a profile section which is preferably produced by extrusion.

In the illustrated non-energised position of the magnet, the duct 40 is in communication with the annular groove 34 through the bore 39 and the annular groove 35 as well as the annular groove 32 on the slide and is in communication with the return through the bore 37. If the coil 17 is energised, then the armature 21 is moved downwards until the intermediate plate 47 engages the yoke 15'. The intermediate plate determines the residual air gap and takes care of a short drop-out period of the magnetic valve. In the then switched position, the annular groove 36 is connected to the annular groove 32 and the connection to the annular groove 34 is interrupted. Thus, pressure medium can arrive from the supply bore 38 to the bore 39 and from there through the duct 40 to the load. If the current is switched off, then the leaf spring and the compression spring 31 bring the armature once again into its illustrated position which is limited upwardly by an off-set abutment plate 48. The control slide once again provides communication from the supply to the return. From that, it must be appreciated that the valve is designed as a 3/2-way valve.

If the housing is produced by sintering the valve

housing can be designed as regards its dimensions independently of the magnet portion. On the other hand, by using a profile section, the diameter of the valve housing corresponds at the most to the width of the magnet portion. The valve housing 12 need not, of course, be round but can be made square like the parts 11 to 13.

With the embodiment according to Figure 3, the same parts are referenced with the same numerals as before. The essential difference therefrom is that the valve portion is formed as a 2/2-way valve. Only two annular grooves 51, 52 are formed in the slide bore 50. Once again, an elongate annular groove 54 is located on the control slide 53. A bore 55 in communication with the source of pressure medium is connected to the annular groove 52 and a bore 56 which is once again in communication with the load through a duct 57 is connected to the annular groove 51. The method of operation is immediately apparent.

At its upper end, the control slide 53 has a flat 59. With the aid of a pin 60, a rail 61 is fixed thereto the other end of which is movably and adjustably fixed to the armature 21, for example with the aid of a clamping screw 62. In this case, the return force for the valve slide 53 is undertaken by the leaf spring so that no further spring is required in the slide bore.

The embodiment according to Figure 4 differs from the previous arrangements in that the valve is made as a 3/3-way valve. Once again, three annular grooves 66, 67, 68 are formed in the slide bore 65 and are in communication with bores 69, 70, 71. Moreover, an elongate annular groove 73 is located on the control slide 72 and which can be brought into communication either with the annular grooves 66, 67 or with the annular grooves 67, 68. Once again, the return is connected to the bore 69, the pressure medium source to the bore 71 and the load to the duct 74. The said 3/3-way function is produced by this construction.

A ball 75 is located at the upper part of the control slide and over which a plastics part 76 projects which is also pushed over the rod 77. In that way, the rod and the slide 72 are pivotally connected to one another. The plastics part 76 can, for example, be connected to both parts by ultra sonic deformation. This magnetic valve also has the peculiarity that it is controllable at two current levels. If it is energised by a low current stage then it moves the armature 21 until the washer 79 at the upper part of the rod pre-tensioned by a spring 78 engages the magnet yoke 80 lying somewhat lower down. In this case, the communication from the duct 74 to the return 69 is closed as is the communication from 71 to 74. On switching in the second current stage, the force of the spring 78 is exceeded by a correspondingly higher magnetic force and the slide 72 is moved into its lower limit position. In that way, the communication from the pressure medium source to the return 69 is closed but the communication from the pump to the load connection 74 is open. In the embodiments according to Figures 5 and 6, are simply concerned with the connection between the rod and the valve slide which, in the embodiment according to Figure 5, takes place by means of a ball joint 81 and in the embodiment according to Figure 6 takes place by a clamp 82. Clearly, many other resilient or rigid connections can be imagined.

CLAIMS

1. A magnetic valve comprising a housing and a magnet core carrying a coil arranged therein and which has a longitudinal bore passing through it into which penetrates a transmission member (rod, rail or the like) connected to a plate-like armature and connected to a control slide guided in a valve housing, characterised in that, the housing (10) together with the magnet core (15) and the valve housing (12) form a unitary component.

2. A valve according to claim 1, characterised in that, the armature is articulated to the housing by means of a leaf spring (22).

3. A valve according to claim 1 or 2, characterised in that, at least one web (43, 44) is formed on the component.

4. A valve according to one of claims 1 to 3, characterised in that, the transmission member (20, 61, 77) is resiliently connected to the control slide (29, 53, 72).

5. A valve according to one of claims 1 to 4, characterised in that, a compression spring (31) acts on the control slide (29) and so adjust the control slide when the magnet is not energised that communication is produced from the load to the return.

6. A valve according to one of claims 1 to 5, characterised in that, the valve is formed as a 2/2-way valve, 3/2-way valve or as a 3/3-way valve.

7. A valve according to one of claims 1 to 6, characterised in that, the transmission member from the armature to the control slide is formed as a rail (61) which can be adjustably fixed to the magnet armature (21) by means of a clamping screw (62).

8. A valve according to one of claims 1 to 7, characterised in that, the rod (77) is connected to the control slide (72) by a plastics part (76).

9. A valve according to one of claims 1 to 8, characterised in that, the armature and with it the control slide can be brought into different positions by different current stages so that particular switching functions can be established at the control slide.

10. A valve according to one of claims 1 to 9, characterised in that, the unitary component is produced from sinter material.

11. A magnetic valve according to one of

claims 1 to 9, characterised in that, the unitary component is formed as a profile section and is preferably produced by extrusion.

12. A magnetic valve substantially as herein described with reference to Figures 1 and 2 or Figures 3 to 6 of the accompanying drawings.

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